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Journal of the Society of Arts.

FRIDAY, MAY 25, 1855.

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FOURTH ANNUAL CONFERENCE AND 101st ANNIVERSARY DINNER.

The Council beg to announce that it is intended that the Fourth Annual Conference of the Representatives of the Institutions in Union should take place early in the first week of July. Also that the One Hundred and First Anniversary Dinner should be held on or about the same day.

Detailed particulars will be published next week.

TWENTY-THIRD ORDINARY MEETING.

Wednesday, May 23, 1855.

The Twenty-third Ordinary Meeting of the One Hundred and First Session, was held on Wednesday, the 23rd inst., Sir William Cubitt, F.R.S., one of Her Majesty's Commissioners for the Great Exhibition of 1851, in the chair.

The following Candidates were balloted for and duly elected :—

Coote, Thomas
Edwards, Rev. David
Granville, Walter Long Bozzi
Wanostrocht, Vincent

The following Institution has been taken into Union since the last announcement:—

394. New Swindon, Mechanics' Institute.

The following paper was read on the opening of the Animal Department of the Trade Museum :—

ON THE MUTUAL RELATIONS OF TRADE AND MANUFACTURES.

By Professor Edward Solly, F.R.S.

In proposing to consider so comprehensive a subject as that announced for this evening, in the short space of a single paper, I shall perhaps be deemed somewhat presumptuous; but as it has been determined to-night to throw open to the members of the Society the collection of Animal Produce and Manufactures formed under the joint sanction of the Society and the Royal Commissioners for the Great Exhibition of 1851, and designed to form the first division of a general Trade Museum, I am anxious to take the opportunity of drawing your attention to a few more widely-spread subjects of consideration, than those immediately connected with the formation of the Trade Museum.

I do not intend, however, to enter at all into the examination of those great and important questions of political economy which relate to the mutual bearing of trade and manufactures, and the importance of these two sources of national wealth as contrasted with agriculture; I shall confine myself to drawing your attention to the mode in which either progress or decay in the one, has always influenced, and ever must influence, the prosperity of the other; the evils which throughout have arisen from unfair monopolies, and from the wilful or accidental ignorance of technical matters in those by whom restrictions and protective enactments have been framed; and in conclusion, I shall briefly remind you of the nature and objects of the proposed Trade Museum, and point out some of the ways in which I conceive it will prove of national utility, serving at the same time to illustrate the history of past industry, to indicate the sources of present prosperity, and to suggest the best and most desirable objects for the exertion of future energies.

On looking back to the past history of the commerce and manufactures of the world, it is impossible not to be struck with observing, how greatly the progress of individual nations has fluctuated from century to century, and in many cases how little their commercial prosperity has resulted from the wisdom or energy of their rulers. In most instances, a good deal has depended on the active and persevering habits of the people themselves; and in many cases the most important changes and modifications in the commerce and manufactures of a country, may be traced to causes in operation at a distance, and at first sight apparently wholly unconnected with it.

The increase of any one branch of manufacture—that is to say, the production of any article in much larger quantities than the producing nation is able to consume—always of necessity leads to a corresponding increase in commerce and navigation, though it by no means follows that the producing nation shall reap the whole benefit of the commerce thus caused. Prosperity from manufacture, and prosperity from trade and navigation, may occur at the same time and enrich the same persons, but there is obviously no necessary connection between the two; for we often find that whilst one country becomes rich and prosperous from certain branches of manufacture for which it possesses peculiar advantages, another nation may derive profit from the sale of those same manufactures to people inhabiting distant parts of the globe. The cases of Tyre and Carthage, in olden time, and the sea-port towns of Italy and Holland in later periods, are familiar illustrations of wealth acquired by commerce almost wholly independent of manufacturing skill or prosperity. These cities were chiefly, if not entirely, marts in which the productions and manufactures of other countries were sold and exchanged. We hear of merchants and traders, but not of manufacturers; and as in the brief, but highly descriptive account of Tyre given in the book of Isaiah, we are told,—"Her merchants are princes, and her traffickers are the honourable of the earth;" so also, in searching for the causes which led to the prosperity of more modern cities, such as Antwerp, we find that it was the resort of traders from all parts of the world, and that its merchants traded in the productions of France, Spain, Italy, England, and Germany; and exchanged the manufactures of these countries with the spices and other tropical productions of the Indies, China, and Africa. The merchant traders were thus collected together in particular cities, which became general emporiums of the trade of the whole world; and we read of them as living in palaces, surrounded with costly furniture, and all the magnificence and luxury which wealth could procure or the most cultivated tastes desire; whilst the manufacturers and artisans,with the produce of whose labours they traded, were spread abroad and scattered over large tracts of country; and hence, whilst we easily recognise the wealth of the merchants of the great trading sea-port towns, we are apt, to some extent, at least, to overlook the wealth amassed by the isolated and more widely-settled manufacturers. In every case, however, there exists an intimate relation between the two classes; and whenever merchants prosper, we may surely trace a corresponding and proportionate amount of prosperity in the producing classes, either in the same country or at a distance.

When the martial habits of the Romans began to decline, and when the wealth acquired chiefly by conquest and plunder was made to minister to the artificial wants of society created by luxury, we find them employing the productions of the most distant parts of the globe, and a demand sprung up for many substances which were before unknown, or regarded as useless by their more warlike ancestors. Thus, in the time of Aurelian, silk was sold for its weight in gold; for the taste for rich garments of silk had continued to increase amongst the people, in spite of the law previously passed by the senate, "that no man should disgrace himself by the effeminate delicacy of silken apparel." The Romans were not then a trading people; their foreign luxuries were all brought to them by other nations, and for their supply of silk they were wholly dependent on the Persians. It is plain that the producers in China must have been paid a remunerative price for their silk, and it is well known that the Persian traders, who bought the silk of the Chinese and sold it to the Romans, made great profit by the traffic; whilst the latter people, at whose expense all this was done, had nothing to do with the production, manufacture, or commerce of silk. They scarcely knew whence it came, and they were ignorant of its nature, and the mode in which it was obtained.

Early writers make special mention of the extortionate charges of the Persian merchants, and point out how this led to the final destruction of the trade in which for several centuries they had enjoyed a monopoly; for in the year 450, the Emperor Justinian, seeing how the ever-increasing trade in silk tended chiefly to enrich the Persians, was led to try and introduce the cultivation of that article into Constantinople—an attempt eventually successful, though in the first instance nearly frustrated by the avarice of the Emperor, who assumed to himself the entire monopoly of the production of silk, and sold that made in the imperial manufactory at a price nearly eight times as high as that previously paid by his subjects to the Persian traders.

The history of the silk and woollen manufactures, and the trade in articles made from those substances, afford a number of interesting illustrations of the mode in which most manufactures have spread, and the vicissitudes to which commercial prosperity has ever been exposed. In the first instance, we generally find a particular place or country celebrated for some special kind of manufacture; gradually it becomes an article of export to other countries, and the exportation is profitable. Then ingenuity is set to work to improve the manufacture or to simplify the processes; and these improvements, by diminishing the cost of production, increase the exportation and render the trade still more profitable. After a while competition commences: the profitable trade leads others to try and compete with the first producers; and a more active people, a more favourable climate, cheaper labour, or increased mechanical skill, form powerful rivals. Sometimes they only act as a stimulus to call forth more energy and more active exertion; but often the original manufacture is destroyed, and its seat transported to another country. Sometimes, too, the same result is brought about by political or religious revolutions; and occasionally we find a trade suddenly ceasing in consequence of the demand for an article being altogether destroyed, and some new material substituted for the purpose to which it had previously been applied. There is a remarkable instance of this in the manufacture of Chamois leather for military clothing, with which England supplied most of the European armies at the close of the last century. The material was excellent in time of peace and worn on parade and in ordinary garrison service, but it was not fit for active warfare. This was found out in the course of the Peninsular war. The use of leather clothing was discontinued not only in the English army, but also in that of most other European countries, and the English manufacture of Chamois leather was almost abandoned.

If we study the commercial history of the whole world, we are enabled to trace out the gradual development and steady increase of each branch of manufacture in a manner which, for the reason just mentioned, it is hardly possible to do if we confine our inquiries to the history of a single country. The intelligence and technical knowledge of mankind is ever on the increase, though the skill and prosperity of particular nations may decrease. Now and then a special process or even an entire branch of art is lost; but this is more than compensated by the advance which is constantly taking place in other arts. The power-loom, the Jacquard-loom, and the stocking-frame, were each of them immense improvements on the modes of manufacture previously in use; but if we trace their effects on any one single country alone, we obtain a very partial and imperfect idea of the real influence which they have exerted on manufacturing prosperity generally.

The mutual relation of manufactures and trade is shown by the manner in which anything which increases the facilities of transit or navigation, by facilitating commerce, acts as a stimulus to manufacture; just as on the other hand every great improvement in manufacture as necessarily leads to an increased development of commerce. Writing on the influence of cheap and rapid transit on commerce, Adam Smith remarked in 1775, that in order to convey four tons of goods from London to Edinburgh and back, a broad-wheeled waggon, attended by two men and drawn by eight horses, would be employed for six weeks, a fact which serves well to illustrate the effect of railways, as the same work is now easily performed in two days. Changes such as these not only modify existing commerce, but also call into existence many new sources of trade. For example: a traffic in fish, eggs, fruit, and fresh provisions, could easily be carried on between places as far distant as London and Edinburgh with the facilities of railway conveyance, which, with nothing but the old broad-wheeled waggon, would be obviously impossible.

So also the gradual improvement in the monetary system of nations. The establishment of systems of exchange —banks and bills—has had a most important bearing on the prosperity of manufactures and the spread of commerce. In the time of Homer the current coin of the realm was oxen, and we are told that whilst Diomede paid nine oxen for his suit of armour, that of Glaucus cost him one hundred head of cattle; now there can be no doubt that the introduction of a suitable and more divisable mode of payment must have greatly facilitated the buying and selling of merchandise.

From the very earliest periods of history, commerce has received the especial attention of kings and governments, and commercial laws and enactments are to be found amongst the most ancient statutes on record. Legislative influence has been brought to bear on trade and manufactures in various forms; the chief being the imposition of duties levied as a means of revenue, —protective duties, ordained with a view to protect certain branches of industry against other branches, or against the importation of cheap foreign wares,—patents, bounties, privileges, and other kinds of special encouragement, granted with a view of fostering and assisting in the improvement of particular trades.

On carefully studying the commercial history of the world during the last seven centuries, one is led to question whether on the whole legislative interference has not done more harm than good. Certainly, if it be assumed that the various enactments made were faithfully drawn up, and honestly intended to benefit arts and commerce, it is lamentable to observe in how many instances they have frustrated the very objects they were enacted to assist. In most instances we find that whilst vested rights, having powerful friends at court, were assisted and protected with fines and duties, the true interests of the nation as a producing, manufacturing, and exporting country were left to chance, or sacrificed to ignorance and cupidity.

We must, however, not include in this general criticism, those promises of bounty and encouragement, which in the history of each country we find the wisest and most intelligent monarchs offering to the ingenious artizans of other nations, as inducements to come and settle in their dominions, and thus introduce those arts for which they have become celebrated in their own countries. Frequently, from some political or religious disturbance, the inhabitants of a manufacturing district have been led to emigrate, carrying their families, workpeople, and factories with them; and, in such cases, the neighbouring monarchs have often endeavoured by promises of patronage and protection, to induce the fugitives to seek a new home in their dominions. Thus, for example, in 1331, on the occasion of disturbances in the Low Countries, Edward III. granted a special letter of protection to any workers in wool, who would come over and settle in England. His invitation was accepted by about seventy Walloon families, and we may even to this day trace the influence and effects of the new blood thus introduced into the woollen manufactures of the country. Again, two centuries later, when the cruel tyranny of the Duke of Alva induced the inhabitants of Antwerp and other cities in the Netherlands to fly from their native country, the wise policy of Elizabeth caused many of them to come over into England; and then again our woollen manufactures received a most important impetus and advancement.

But the species of legislative interference with manufactures to which I have referred is that which we find in such Acts of Parliament as, for example, the Act of 1571, passed to favour the knitted cap makers, who had become jealous of the new felt hats, then recently introduced, and which seemed likely to replace the knitted caps altogether. It was, therefore, enacted that every person above the age of seven years, should wear a woollen cap of English make on Sundays and holidays, on pain of forfeiting 3s. 4d. a day, if they neglected to wear such a cap—lords, knights, and landed gentry, being of course, excepted—or, again, in the Act of 1721, enacted out of compliance to the wishes of the silk button makers, wherein it was ordained, that no one should henceforth wear buttons covered with wool, or cloth, on any pretence whatever. Acts of this sort tended to injure trade, and though in many instances the penalties were very heavy, they hardly ever fulfilled the purposes for which they were passed, because they were generally evaded. Thus, the Act of 1566 against the importation of live sheep—passed, partly with the idea that the English sheep was the only kind in the world bearing wool suited to the manufacture of broadcloth—the penalty was for the first offence forfeiture of a man's entire substance, imprisonment for a year, and the loss of his left hand; whilst the second offence was made felony, without benefit of clergy. In those days, it is well known, many an illegal act was allowed to pass unnoticed, if the transgressor was able and willing to pay a handsome sum by way of fine; and, moreover, smuggling existed to a very large extent.

Two chief reasons have from time to time been advanced in justification of these, and a thousand similar enactments: the one was, protection to native industry, —the other preservation of the balance of trade. The time has now come, when it is pretty generally acknowledged that protection of one class implies injustice to another, and that a trade which needs protection to guard it from the rapid advances of some other branch of industry, considered in a national point of view is seldom deserving of protection. The so-called balance of trade is also fast becoming a matter of history; though we may trace the evil influence caused by its introduction into commercial legislature to a very recent period; it is now generally admitted that a trade in order to be lasting must be profitable to those who carry it on, and that if the exportation of a certain quantity of goods does not bring back in return goods of still greater value to the country so exporting, such a trade would soon cease to be worth carrying on.

The trade between this country and France has for centuries suffered from the measures taken to preserve this imaginary balance, which have often led to the most unwise and injurious restrictions. Invariably, we find that the imposition of prohibitions and high protecting duties on the importation of foreign manufactures has had a depressing effect on our own manufactures; and on the other hand, benefit has nearly always arisen from the reduction, or abolition, of such duties. When in 1628, King James, observing how large a quantity of undyed broadcloth was exported to Holland, the Dutch being more skilful dyers than the English, determined to prohibit the exportation of undyed cloth; he endeavoured at the same time to improve the art of dyeing in England, and to secure to himself a revenue from the sale of home-dyed cloth, of which he proposed to retain a monopoly. The attempt wholly failed, for, as might have been expected, the Dutch and most other importing foreign nations at once prohibited the importation of dyed English cloth, and King James's project had to be relinquished.

Again, when in 1824, it was determined to admit French manufactured silks into England, it was ordained that a period of two years should elapse before the new law came into operation, under the supposition that this time was necessary to enable our manufacturers to prepare for the competition to which they would then be exposed. But the time thus permitted to elapse was employed by the French manufacturers in preparing large stocks of goods ready to be introduced into England as soon as the new duty came into operation; and hence our manufacturers again took fright, and a new and most illiberal enactment was made. The silk manufacturers of France were all in the habit of making their goods to a certain length; to prevent, therefore, the importation into England of any of the large stock of goods manufactured for the English markets during the two years between the passing of the Act of 1824 and its coming into operation in 1826, a fresh Act was passed just before the latter period, enacting that no silk goods should be imported unless they were of a length somewhat longer than the standard length adopted by all the French manufacturers. It is curious to observe how this illiberal and unwise Act, in fact, increased the very evil it was intended to obviate. It at once produced an immense increase of smuggling, and in place of having to compete with French goods imported under a moderate protective duty, our manufacturers had, in fact, to compete with the same goods brought in without paying any duty at all.

Another good example of the same effect is afforded by the policy of the French government towards England early in the present century. With a view of injuring the commerce of England they prohibited the importation of a considerable number of articles of merchandise into France; this completely interrupted the whole system of European international trade, and led the Swiss to abandon some of those branches of industry which they had hitherto carried on, and to enter largely into the silk manufacture. Thus the attempt of the French to injure the cotton trade of England led to the establishment of a formidable rival to their own silk trade.

In many of these enactments it is remarkable how much want of knowledge is shown; it is evident that party favour and patronage were the real causes which led to a large number of them; but independent of this, and where no unfair partiality was intended, it is plain that those in power not only did not possess the information necessary to lead them to form correct judgments respecting the interests committed to their supervision, but that in fact it was not in the power of any one to supply them with such knowledge. I have already mentioned the fact that the Romans were ignorant of the source of silk, believing it to be a vegetable production—and as an illustration of this, the passage in the second book of Virgil's

Georgics is often quoted, in which he speaks of the Indians as combing the soft fleeces of the bough, an expression also used by Herodotus and Theophrastus. An error such as this is hardly to be wondered at when we remember the tedious and uncertain communication which then existed with so remote a country as China; we need not, however, go so far back in history for examples of commercial ignorance far more remarkable than this. It is difficult to believe that scarcely two centuries since the following was gravely stated by Isnard as the mode of rearing silkworms:—

"Take a cow about to calve, and feed her on mulberry leaves alone till she has calved, and continue to feed both her and the calf on the same food for eight days; then kill the calf, and chop it up entirely into mincemeat, and place this in a wooden trough at the top of a house, in a garret or loft; when the whole is thoroughly corrupted, numerous small worms will be found in it, which must be carefully picked out and fed on mulberry leaves; this is an infallible receipt."

This extraordinary story was gravely copied by both Pomet and Lemery, writers of no inconsiderable repute at the end of the seventeenth century, though the latter, it must be added, appends by way of commentary, that the receipt needs confirmation.

Another curious illustration of how little was known of the true nature of the most important articles of commerce is afforded in the history of cochineal. So recently as 1724, a Dutchman, named Reusscher, publicly stated that this dye-stuff was, in fact, the dried body of a small insect; his statement was denied by one of his townsmen, who asserted most positively that it was the seed of a plant; and the dispute was carried to such a length that a commission was appointed to investigate the matter in Mexico, and the legal documents establishing the animal nature of cochineal arrived in Amsterdam in October, 1726. It is stated by Beckman that the advocate of the vegetable origin of cochineal was so confident of the truth of his view of the subject that he had bet the whole of his fortune on the result of the inquiry.

Another curious illustration of want of knowledge in framing legislative enactments is shown in the proclamation issued by King Charles I., in 1630, ordaining, amongst other things, that no silk shall be dyed in the gum, or before it has been entirely removed by boiling; yet, eight years after, we have a counter-proclamation in which this restriction was removed, the proclamation stating that the king had now become better informed on the subject, and understood that silk so dyed was proper for the manufacture of taffetas, figured satins, ribbons, and ferrets; but our admiration at the unusual candour of this edict has hardly passed away before we find the same monarch ordaining that no person should be admitted into the Weaver's Company unless he was a member of the Established Church of England.

The progress of improvement was, however, more often impeded or retarded by protective enactments arising from the influence of existing interests than from mere ignorance; thus it is curious to observe the violent opposition which indigo met with on its first introduction as a substitute for the old Saxon dye-stuff woad. It is stated by Schreber, in his history of that substance, that, on the introduction of indigo, the German Diet, in 1577, strictly prohibited all persons, under the severest penalties, from using the "newly invented, pernicious, deceitful, eating, and corrosive substance called the devil's dye;" which enactment was confirmed and continued by this Diet again in 1594 and 1603, and still more strongly by Duke Ernest, the Elector of Saxony, in 1650; nay, so far was this persecution of indigo carried, that in Nuremberg a law was passed compelling all dyers to take a yearly oath that they would not use indigo, and the custom of taking this annual oath so far became one of the acknowledged habits of the trade that it was kept up long after the value of indigo was generally acknowledged, and its use universal amongst dyers.

In France, too, a similar war was declared against indigo, and it was not till so recently as 1737 that dyers were permitted to make use of it without restriction.

In our own country the same kind of legislative interference took place with regard to logwood. The ground on which it was declared objectionable was, that the colours dyed with it were fugitive and uncertain, hence in the twenty-third Elizabeth, 1581, an Act of Parliament was passed, prohibiting the use of logwood by dyers, on the ground that "the colours thereof be false and deceitful to the Queen's subjects at home, and discreditable beyond sea to our merchants and dyers;" and, because this Act had not the desired effect, and the use of logwood continued to spread, two additional ones to the same effect were passed in 1597 and 1630, and the restrictions were not repealed till 1661, when, by the thirteenth of Charles II., it was set forth, that "the ingenious industry of these times hath taught the dyers of England the art of fixing the colours made of logwood," and therefore permission was given to make use of it.

It is curious to observe how in all these edicts against the use or introduction of any new substance care was taken to make out as good a case as possible by loading the denounced import with many hard names and evil epithets. King James's proclamation on the uses of tobacco is a remarkabble instance of this; for he has ingeniously contrived not only to describe the tobacco itself as noxious and unwholesome, but he has, at the same time, managed to cast a slur upon all those who ventured to smoke. It runs thus:—

"Whereas, tobacco, being a drug of late years found out, and brought from foreign parts in small quantities, was taken and used by the better sort, both then and now, only as a physic, to procure health; but it is now, at this day, through evil custom and the toleration thereof, excessively taken by a number of riotous and disorderly persons of mean and base condition, who do spend most of their time in that idle vanity, to the evil example and corrupting of others, and also consume the wages which many of them get by their labour, not caring at what price they buy that drug; by which immoderate taking of tobacco the health of a great number of our people is impaired, and their bodies weakened and made unfit for labour; besides that also a great part of the treasure of our land is spent and exhausted by this only drug so licentiously abused by the meaner sort—all which enormous inconveniences we do well perceive to proceed principally from the great quantity of tobacco daily brought into this our realm," &c.

It is probable that in no instance has any great improvement been absolutely prevented by these species of enactments, though there can be no doubt that many have been greatly retarded. Upon this subject Beckman truly observes:—

"Legislators are neither almighty, omniscient, nor infallible; with the best views, and a firm determination to discharge their duty, they may recommend things hurtful, and prohibit others which might be attended with advantage. Were their commands and prohibitions inviolable, insuperable, and inscrutable, they would often confine the progress of the arts and sciences, and render useful inventions impossible. But the people, when they have not entirely become machines, know how to elude, even at great personal hazard, faulty regulations, and by prohibited ways to obtain greater advantages than those which formed the object of the orders issued by their government."

Such laws for the regulation of particular arts are as unserviceable and as quaint as the enactment of King James, in 1617, "that all noblemen, knights, and country gentlemen should depart out of London, within twenty days, and go to their country houses, for the exercise of hospitality, and for the comforting of their neighbours."

Whilst, however, we thus find numerous instances of the evil produced by restrictions on the freedom of manufacture, at the same time we also find curious examples of the waste of money and energy in attempting to foster and establish arts to which the country, from physical circumstances, is unfitted; thus, for example, when at the close of the sixteenth century, the silkworm had been successfully introduced into the whole of the south of France, King James determined to introduce it into England, and with this view issued a circular letter in 1608, established a mulberry garden at St. James's, and made special reference to the cultivation of the silkworm in his speeches from the throne. In the preamble to his circular, he states that, "in a few years, our brother the French king hath, since his coming to that crown, both begun and brought to pefection the making of silk in his country." Here the difference in climate between the two countries was altogether overlooked, and the conditions necessary to success in such an experiment were completely forgotten.

In most of the large experiments of this sort, as in the protective enactments which, from time to time, have been ordained, the subject has been treated in a circumscribed and limited manner, and hence the unsatisfactory results to which they have so often led. The manufactures and the commerce of the country have been dealt with in an isolated manner. Instead of taking into consideration the position, resources, and activity of other countries, it seems to have been too often forgotten that our enactments did not influence our own country alone, but must at the same time also affect other countries. Our legislation was, in fact, for the whole world, but the data on which that legislation was based were drawn from considerations connected with a single country, and, in fact, often connected with individual interests. In dealing with our colonies the same course has been pursued. We have acted as though there were no other nations on the globe but England and her colonies; and hence altogether overlooked the influence which foreign countries could not fail to exert on the true balance of trade, the relative manufacturing and commercial prosperity of all the countries of the world.

The history of all great national improvements in manufactures is highly curious and instructive. In the cases to which I have recently referred, where the government of the country has directly interfered to aid and encourage a particular branch of industry, we find many instances like that of King James, which necessarily failed for want of the most simple and necessary elements of success,—true principles, and favourable natural conditions; but there are many others in which entire or partial failure was caused in consequence of the mode in which such interference took place. Thus, in the reign of Henry IV. of France, when the introduction of silk culture was first attempted, the government formed large nurseries, and freely gave mulberry cuttings and silkworm eggs to all persons willing to receive them, and even went to the cost of transplanting the mulberry-trees to the gardens of the peasants. This excess of liberality entirely defeated its object, and the whole thing fell into disrepute. After a few years the system was altered; rewards were given to those who had successfully established silk plantations; and the leading manufacturers who had carried on the manufacture longer than twelve years received patents of nobility.

I shall not now attempt to go into the subject of patents for inventions, or consider in how far the creation of such monopolies has aided the progress of manufacturing ingenuity, though this question is doubtless intimately connected with the matter under consideration. Theoretically, improvements in manufactures may be said to arise either from increased commerce calling for an increased supply of the manufactured article, or from a hope of obtaining increased profit by diminishing the cost of production. The practical fact, however, is, that most of the great improvements in manufactures have been the result of accident rather than of design, and have, in many instances, been originated by very different motives; hence, the ideas suggested have been taken up by others, and brought to perfection, whilst the original designer has too often died in misery and disappointment.

The invention of the stocking-frame, or loom, in the early part of the seventeenth century, by Lee, which, in fact, created a new and most important branch of manufacture, is an example of this. Lee was the son of a country gentleman, a Master of Arts at St. John's College, Cambridge, and apparently in no way connected with trade. The idea of making a knitting-machine, it is said, came simply from his seeing a country girl at work, knitting stockings with needles. Having completed his loom, and established works near Nottingham, he applied to Queen Elizabeth for aid and encouragement, and, receiving none, but rather being impeded, he left the country, and accepted an invitation from Henry IV. to settle at Rouen. The assassination of the King put an end to Lee's prospects of encouragement, and he soon after died in the greatest distress. However, the invention was perfected; it continued to spread in both England and France; and on the revocation of the edict of Nantes, in 1685, when the artizans of France were compelled to seek refuge in other countries, the stocking-loom was carried into all parts of Europe.

Few inventions have had greater influence on the progress of our manufactures than the power-loom; yet this was designed and brought to perfection in 1787, by the Rev. Dr. Cartwright, a man not only wholly unconnected with manufactures, but even quite ignorant of the mode of weaving by hand. It is notorious that Dr. Cartwright expended nearly £40,000 in introducing the power-loom; that he was met with all the delays, annoyances, and opposition which narrow-minded prejudice could raise, and that he finally received a sum of £10,000 from the nation, by way of compensation.

It is a curious historical fact that the general scheme of the power-loom was communicated to the Royal Society, and published in their Transactions, in 1678, more than a century before the date of Cartwright's invention; yet the idea seems to have been regarded, by practical men, as quite impracticable, and by scientific men as unworthy of a trial. At all events, no attempt seems to have been made to test its value.

It would be easy to multiply instances, but I have said enough. I will only remind you that the Jacquard-loom was invented by a straw hat maker, whose attention was first turned to weaving by the premium list of this Society, which accidentally fell into his hands; that the man who practically founded the cotton manufacture of the country, by the invention of the spinning rollers, was not a cotton spinner, but a barber; and that James Watt, when he first turned his attention to the improvement of the steam engine, was a disappointed spectaclemaker.

We see, then, that the progress of commerce and manufactures has gone on, in a manner, wholly independent of the laws and regulations of man. The enactments of governments, intended or professed to aid them, have in many instances failed, and not unfrequently produced results of the most opposite character to that which was intended; whilst the greatest advances have been caused by religious, political, and social revolutions in the first instance, in no way connected with either arts or trade; or have arisen from the accidental discoveries of persons engaged in perfectly different pursuits.

I have hitherto chiefly adverted to the influence possessed by government enactments, because the power thus exerted, whether beneficial or otherwise, is to a certain extent immediate and absolute. The edict comes out with full authority; it becomes at once the law of the land, and must be obeyed; and hence, whilst wise and sound government interference is above all things valuable, so ill-considered and partial measures are peculiarly injurious; they fetter and cripple honest trade, though they never prevent the exercise of dishonest ingenuity.

In looking, however, at the various influences which bear upon the prosperity of manufactures and trade, we must not pass over the very important influence possessed by those occupied in the arts and commerce themselves. This influence is necessarily very great, and is shown in a number of different ways. There are, however, only two of these to which, for the object now before us, I desire to draw your attention; and these are, adulteration and mystery. From the very mode in which trade is carried on, and from the number of hands through which most articles pass, great facilities are given for careless preparation and skilful adulteration of the raw produce; and it is very difficult for the manufacturer who consumes it to persuade the producers that it would be to their advantage, as well as to his convenience, if such practices were discontinued. Unfortunately, too, even in many branches of manufacture carried on in our own country, adulteration, and admixture of inferior materials, is practised to an enormous extent. These are evils almost beyond the power of government interference, and can only be well remedied by the men themselves who carry on these manufactures; and for this a certain amount of combination and unity of purpose amongst them is needed, which, unfortunately, seems hardly compatible with that competition and rivalry which many consider inseparable from trade. Why is it that adulteration is not only permitted, but even encouraged in many instances? Why, for example, should feathers, hair, sponge, and many other articles, be openly and confessedly adulterated, so that when brought over in a clean and pure state they are looked on with suspicion, or even rejected as not marketable? I do not mean to refer to the adulterations too often carried on by retail dealers, but to the wholesale adulteration of the raw material itself, which necessarily depreciates its value, and renders a process of purification the first stage in any art in which such materials are employed. It is bad enough when such admixtures are made in this country; but the evil is more than doubled when it is carried on in a country thousands of miles distant, as then the article adulterated has to bear the cost of freight of the impurities thus added, in addition to the cost of the process necessary for purifying it.

On the subject of trade mystery I will only observe, that I am convinced that it would be far more to the interest of manufacturers if they were more willing to profit by the experience of others, and less fearful and jealous of the supposed secrets of their craft. I am perfectly well aware that there are cases in which it is perfectly necessary that each man should keep his own counsel; as, for example, when a new market for a particular article has been opened to an enterprising firm, it would clearly not be to their interest to communicate this new source of profit to their neighbours and rivals; this, however, is not the secretiveness to which I refer, it benefits some, but does not in any way injure others; whilst the tendency to mystery amongst manufacturers and artisans in truth benefits no one, and, at the same time, retards the progress of ingenuity, and fetters the development of national industry. In the course of the last few months the extensive intercourse which I have had with practical men, has led me to feel the truth of this strongly; for, whilst I have often found them to a great extent ignorant of the progress of their art in other parts of the world, they have, with few exceptions, been anxious to guard from others various practices and processes which, in truth, were no secrets at all. It is a great mistake to think that a successful manufacturer is one who has carefully preserved the secrets of his trade, or that peculiar modes of effecting simple things, processes unknown in other factories, and mysteries beyond the comprehension of the vulgar, are in any way essential to skill as a manufacturer, or to success as a trader. How have the great manufacturers of England acquired their reputations and amassed their fortunes? How have our Bramahs, Cubitts, Fairbairns, Holdsworths, Salts, Marshalls, Gotts, and a hundred others, attained that world-wide reputation which they so well deserve? Was it by the petty mysteries of trade, and by a jealous preservation of the secrets of their forefathers? or, was it not rather a necessary result of a very simple combination of circumstances? The employers were men of unwearying energy, inflexible honour, and sterling integrity; their work-people were well-selected, well-trained, well-treated, well-directed, and well-paid! These, I believe, are the true secrets of trade prosperity; but they are secrets which no one need fear to communicate to his rivals.

I now turn to the more special object of to-night, namely, the Trade Museum; and having briefly stated its objects, and what I conceive it ought to contain, I shall endeavour to show you how it would possess a most important influence on the manufactures and commerce of this country and our colonies.

The Trade Museum should contain samples of the productions of all parts of the world, both raw and manufactured; there should be samples of the leather, wool, silk, woods, gums, oils, dye-stuffs, drugs, stones, ores, and other productions, whether wild and indigenous, or the result of cultivation; so that a visitor could at once compare the silk or wool of France, Russia, Sweden, Italy, or England, with that of Canada, the United States, Persia, China, the East Indies, South Africa, or New South Wales. Again, if he wished to see the productions of any country, he should find arranged together in proper order the produce of each country, so that he could at once know those which form articles of commerce, and those not at present imported. These are two perfectly distinct kinds of information, and the Museum ought to afford them both.

Secondly, there should be illustrations of all manufactures, from the collection or raising of the raw produce, through every stage or operation to which it is subjected, down to the most finished products; and these should be so complete as to exhibit all the more important variations in the processes employed in different countries. Thus, we should not only be able to compare the broadcloth of our own country with that of France, Germany, Belgium, and other countries, but we should also have the means of simultaneously comparing them in every stage of manufacture, beginning with the raw wool, its scouring, combing, carding, spinning and weaving, dyeing and dressing. For this purpose the tools, implements, and machinery should be shown, accompanied by working specimens showing progress, and illustrating the advantages and disadvantages of each process. For example, the dressing of broadcloth of necessity involves the illustration of the means used in raising the surface, the use of teazles both by hand and by machine, and the convenience and faults of the various mechanical contrivances which are employed as substitutes.

Thirdly, the Museum should show progress. It should contain specimens of raw and manufactured articles of known age, for the purpose of comparison with those of the present time, in order that the precise kind of improvement effected may be accurately known and estimated—an element which is quite essential in any attempt to generalise, or to arrive at correct conclusions as to the future progress of any art.

It is almost superfluous that I should point out the necessity of good arrangements in such a Museum, or that I should insist on the importance of the specimens being properly shown, properly preserved, and carefully labelled; it is obvious that much of the practical value of the Museum would depend on these matters. The labels in particular are all important; they should at once express clearly and distinctly the nature and state of each article, and the specimens should be accompanied by maps and drawings illustrating those matters which cannot otherwise be explained. Thus, the cultivation of rice, tobacco, and sugar, needs drawings to show the peculiar modes of tropical farming, and the methods adopted for irrigation; whilst the Sea Island cotton, in addition to these, should be accompanied by maps showing the peculiar geographical conformation of the lands in which it is grown. Lastly, the information conveyed by the specimens and their labels should be extended and completed by a good descriptive catalogue, which should contain all those further commercial, scientific, and statistical facts necessary to the complete elucidation of the history of each substance, its production, and its uses.

In order to be practically useful, such a Museum should be situated in London, within reach of merchants and others likely to desire that information which it would be calculated to give; but I conceive, in order to render it thoroughly useful, it ought to be made a centre for the dissemination of technical knowledge, and for aiding local museums in all parts of the country, and indeed in the colonies also. When, for example, a specimen of any new sort of produce was received, it should, if possible, be divided into several portions, one to be preserved in the best possible manner for future reference, whilst the remainder should be employed in practical experiments, and sent to other similar establishments in the manufacturing towns and elsewhere.

It would be difficult perhaps to obtain at all a completed collection in illustration of the progress of any of the older arts and manufactures, though a vast number of valuable illustrative specimens might no doubt be collected; it would, however, be easy to record the present state of the arts, and the specimens collected for this purpose would soon become historical, and the work which now might be completed with comparatively little trouble, would in a few years become as difficult as it now is to collect records of the progress of the last century.

I conceive that the Museum should be essentially progressive; that it should always show the most recent improvements in each art; but that the illustrations of the progress of past years should be carefully preserved for reference, as in many instances most valuable information may thus be derived.

In this brief detail of the chief objects which I conceive should be borne in mind, in carrying out the formation of a General Trade Museum, I am aware that the scheme is a large one, and one involving much labour and considerable expence; but I feel that the objects contemplated are all of importance, and that though it would be of much value if only part of it were carried out, yet that while collecting materials for one portion, a very little more trouble would enable us at the same time, also, to collect those for all the other departments of the Museum. Such an establishment would be of the greatest practical value to merchants and manufacturers, and would supply them with information, the importance of which can hardly be too highly rated. I have, during the past few months, had many examples of the superiority of illustrative specimens over mere printed descriptions; for I have had many visits from practical men, who, though in the outset they have said, "*your Museum would be of no use to us*," have, nevertheless, after a little discussion, and above all after examining specimens in illustration of special arts, gone away in a very different spirit, saying—"*I have learned some practical facts which I never knew before, and which will be of considerable use to me.*"

But it is not only to merchants and manufacturers that such an establishment would prove of value; let me remind you of the innumerable technical questions which have arisen during the past year alone, respecting the productions of those countries which border on the Baltic and the Black Sea. How valuable a complete collection of the coals of Asia Minor, accompanied by scientific and statistical information, would have been, when first the question of supplying our steam fleet in the Black Sea with coals was under consideration; and how useful would the Trade Museum have been, when the relative value of different kinds of preserved and portable food was being discussed, had there existed an authorised establishment in which specimens of these various articles had been deposited and exposed to varied circumstances for a definite number of years?

In conclusion, let me state very briefly what has been done towards the commencement of such a Museum. You are aware that the Council acting with the sanction and co-operation of Her Majesty's Commissioners for the Great Exhibition, determined to form a collection of animal produce and illustrations of those arts in which animal substances are employed, and in this work I have for some months been busily occupied. A portion of the collection is now arranged in the model room, and will remain open to the members of the Society, and to the public, for some time, during which, I trust some determination will be arrived at as to the future progress and destination of the Trade Museum of which this forms the commencement.

I must remind you that the state of affairs, both political and commercial, all over Europe, for the last year, has been peculiarly unfavourable to the collection of foreign produce and manufactures, and that I have had great difficulties to contend with in the collection of specimens and the formation of anything approaching to a tolerably complete series of the chief animal substances used in the arts. As regards the collection now in the model room, it has been arranged with extreme haste, the late exhibition of inventions having rendered it impossible to commence the disposal of the animal collection till a few days ago, whilst the very limited accommodation afforded by the room, has rendered it necessary to exclude a very large part of the collection, some portions being altogether unrepresented. The specimens must be considered as being only temporarily grouped together, and not arranged as they would be in a permanent museum. The collection is numerous, and complete enough to show the practical nature of such a museum, and to illustrate some of the kinds of knowledge which it would convey, and some of the purposes to which it might be applied: and I would only, in conclusion, express an earnest hope that the commencement thus made by the Society will be taken up with spirit, and prosecuted with energy. That the Museum will be thoroughly appreciated ere long by practical men, I entertain no doubt whatever; and I may truly state, that the most difficult part of the undertaking, the formation of a nucleus, is now accomplished: it will be far less trouble to supply the deficiencies in the animal series, and to complete the other departments of the Museum; and from the numerous and increasing promises of aid which have lately been made, I feel confident that there will be no difficulty whatever in fully carrying out the formation of the General Trade Museum, as soon as the permanent establishment of such a collection, and its location in a suitable place shall be decided on.

Dr. Lyon Playfair, C.B., said, he had great pleasure in rising to propose a vote of thanks to Professor Solly for his interesting paper, and they would, he was sure, consider it as a vote of thanks well due to him when they had seen the interesting collection down stairs, and which he was informed was only a small part of the collection which was already the property of this Society jointly with the Commissioners for the Great Fxhibition of 1851, for he had been told by the Secretary, that out of 400 cases, only about 160 were represented down stairs, owing to the circumscribed space which was available for the Exhibition; so that after they had inspected what was enabled to be displayed, they might form an idea of the value of the remainder of the collection. The great importance of such a museum must be apparent to all. In this great metropolis they had two museums, one representing the economic applications of minerals to the useful purposes of life, situated in Jermyn-street, and designated the Museum of Practical Geology, and the other, representing the economical applications of botanical substances, situated at Kew. They were sadly wanting in a museum which should represent the industrial applications of animal products, and this was the first time that desideratum had been supplied in this or in any other country. It was to be remarked in the first place, with regard to the scientific collections of this country, that they were scattered and separated, and in the second place, they did not bear upon the industrial application of the products exhibited; and, therefore, to all those who wished to study first the science and secondly the industrial applications of the products, so that they might be enabled to make the comparison necessary in such a pursuit, some means of collecting these products together in a convenient form, and in a suitable place, was of very great importance. Our museums might be said to have out-grown themselves; and it was, therefore, indispensable that they should have a centre in which science should lead on to the industrial applications, to the useful purposes of life. This had been one of the greatest wants of the country, and one which this Society had now the opportunity of putting their shoulders to the wheel to remedy, for in about six weeks time they would be called upon to say what was to become of the very interesting museum down stairs. He had only gone over the collection cursorily, but he was astonished at it. Knowing much of the skill and ability of Professor Solly, he had expected much, but he had formed no idea of so complete a collection as he (Mr. Solly) had succeeded in realising. He thought it promised to be one of the greatest importance, and Professor Solly deserved the highest credit; but, as he had before said, in less than two months—as the Society would then require their room again for other purposes—they would be called upon to decide whether it was to be packed up and stowed away in a damp cellar to rot, as had been the case with some other collections, which he need not now specify. The consequence was, that if they did not look after this collection, all the great amount of labour that had been bestowed upon it would be lost to the public; and, therefore, it was essential that they should find some means of making this collection not only available to the public, but giving it good house-room; and he did not know how that was to be had unless the public moved in the matter. As to the importance of the museum he would not say a word, except to point attention to the skilful manner in which Professor Solly led from the raw material to the manufactured products, and the care which he took of the waste products, exhibiting the various shapes in which those hitherto waste products were again brought into the useful purposes of life, so that nothing was, in fact, waste—which was the great point for science to attain. They would shortly have an opportunity of witnessing this collection, and he would therefore conclude with moving a vote of thanks to Professor Solly for his interesting paper, and they would also consider it as a vote of thanks for the great success which had attended his efforts to establish the first museum of the useful products of animal life.

Sir John Boileau, Bart., said he had been asked to second the vote of thanks to Professor Solly, and he did so with great pleasure, because he thought nothing could be more desirable than that the opening of a Trade Museum should have been prefaced by a paper such as they had just heard. That paper pointed out to the public, in the first place—and it must reach to all governments—that the most desirable thing for trade was that it should be left free and unfettered; that any attempts at prohibition on the part of foreign countries, on the one hand, or to prop up trade by favourable circumstances in our own country, on the other hand, were sure to cripple energy, and in the end be hostile rather than beneficial to the true interests of trade and commerce in any country. He thought they were much indebted to Professor Solly for having brought before the notice of manufacturers that they were best serving their own interests when they did not lend themselves to mystery and concealment; but when they threw open every circumstance connected with their trade, by which information was gained for themselves, and their own ends were forwarded. He believed the Society of Arts had gone to a considerable expense in raising this Trade Museum, and with the funds at their disposal they could not be expectad to go beyond what they had done. What could be done had been done fairly and with very great energy and great zeal on the part of Professor Solly, aided by the Council of this Society; but he (Sir John Boileau) feared, with the learned gentleman who had proposed the vote of thanks, that unless some great exertion was made, all the results would ultimately perish, because it was impossible that such articles as composed the collection below could not but be injured unless they were placed in some proper and favourable locality. He was not there to say where that locality should be or how it was to be obtained. Had he the power to do so he would be very glad to exert it. He only wished to press upon the meeting that they ought to make an exertion, if possible, to obtain from the government some place where this exhibition might form the nucleus of a more extended museum, and if they could not succeed in that, he would express his individual hope (for he had no authority to make any statement on the part of the Society), that the known liberality which existed throughout this country, and in the strong desire which prevailed to forward that which was beneficial to the public, individuals would come forward and find some locality, in the event of the government failing to do so, where this great step in the advancement of the trade of the country should not perish, but should remain and increase, and prove a permanent benefit to the public at large.

The vote of thanks to Professor Solly, having been carried by acclamation, was presented to that gentleman by the chairman in the name of the meeting.

The Secretary announced that the paper to be read on Wednesday next, the 30th inst., which would be the last ordinary meeting of the present session, was "On Earth-Boring Machinery," by Messrs. Mather and Platt.

After the meeting the members and visitors proceeded to the Model Room to examine the collection, of which the following is an

EXPLANATORY MEMORANDUM,

Descriptive of the Selections of Samples of Animal Produce and Manufactures, now exhibiting in the Model-room of the Society of Arts, and forming part of the Trade Museum, *Animal Department, undertaken by the Society with the sanction and co-operation of Her Majesty's Commissioners for the Great Exhibition of* 1851.

The collection is designed as the commencement of a general Trade Museum, or collection in illustration of the productions, industrial resources, manufactures and commerce of all countries. The portion now brought together is confined to Animal products alone. In consequence of the extent of the collection, and the limited space which could be devoted to it, it has been found necessary to exclude many articles altogether, and leave out many important illustrations in each series. The following brief memorandum is prepared for the purpose of given a general idea of the scope and nature of the collection, and the order in which the specimens have been arranged. The division employed is merely a technical one, adopted for convenience of classification; the mode of arrangement was necessarily suited to the form and appliances of the room. The series commence at the south-east corner of the room.

1.—Wool Series.

Extending along the whole of the south and west sides of the room, and including fleeces and samples of all the chief varieties of Wool, British, Colonial, and foreign; illustrations of the manufacture of most woollen fabrics, dyeing of wool, samples of broad and narrow cloths; tweeds, Tartans, flannels, felts, cords, &c.; Coburgs, merinos, lastings; alpacca and mohair fabrics, plush, moreen, damask, carpets, fancy wools, &c. Pilots, petershams, witneys, shoddy manufactures, manufacture of woollen paper, and flock paper.

2.—Silk Series.

Arranged along the north side of the room; including the silk-worm and its economy; the wild silk-worms of India, allied moths, cocoons. Raw silk, British, Colonial, and foreign—organzine, thrown, and tram silks; silk-dyeing—weaving plain silks, Persian, sarcenet, gros de Naples, watered silks; satins, velvets, fancy weaving, the Jacquard loom, fancy silks, silk poplins, silk damasks, ribbons, silk laces, trimmings, small wares, buttons. Manufacture of waste silk—silk hat making. Historical specimens showing the progress of silk-weaving.

3.—Skin Series.

Arranged at the north-east corner of the room; consisting of raw skins, the various astringent substances used in tanning; specimens of the chief varieties of leather; tanners' tools, leather dressers' tools, tools used in currying leather. Uses of leather—boot and shoe making; manufacture of lasts by hand and by machinery; leather, silk, and satin boots and shoes. Bookbinding, tools used; illustrations of bookbinding, showing the progress of the art. Glove-making. Saddlery,—saddlers' and collar-makers' tools. Manufacture of parchment; tools used, and process employed. Gold-beaters' skin. Manufacture of glue.

4.—Horn and Bone Series.

Grouped together on the east side of the room; including the horns of the ox, buffalo, deer, rhinoceros, &c. Manufactures of horn; comb-making, drinking-cups, buttons, &c. Tortoiseshell, its manufacture, tools used, &c. Bone, manufacture of tooth-brushes. Teeth. Ivory, fine and common turning. Narwhal and other tusks used as substitutes for ivory, &c.

5.—Fur Series.

Placed south of the horn and bone series. Specimens of some of the chief furs used for ornament, clothing, or furniture; illustrations of their uses.

6.—Bristle Series.

Immediately below the fur series; including the chief varieties of bristles imported; and illustrations of their use in brush-making. Household brushes, hair brushes, of wood and ivory, tooth brushes, artists' brushes, painters' brushes and tools. Illustrations of different modes of brush-making.

7.—Feather Series.

Arranged on the central horse-shoe table beginning at the north-east pillar. Samples of all the chief kinds of feathers used in upholstery; illustrations of their purification. Manufacture of writing quills. Manufacture of artificial flies for fishing. Use of feathers for ornament, feather flowers.

8.—Horsehair Series.

Placed on the centre horse-shoe table at the south-east pillar. Horsehair, of all kinds, as imported. Illustrations of its chief uses, manufacture of horsehair seating, dyeing of horsehair, horsehair for brushes, horsehair buttons, horsehair pressing cloth, crinoline, and stock stiffening. Horsehair ornaments.

9.—Lac Series.

Arranged on the cross table between the two south pillars. Samples of all the varieties of lac, as imported. Manufacture of lac dye, bleaching of lac, manufacture of sealing-wax, preparation of lake, &c.

10.—Wax Series.

Placed opposite the fur series. Wax of all countries, bee-hives, and bees, bleaching of wax, manufacture of wax candles, colouring of wax, artificial wax flowers. Chinese wax, &c.

11.—Oil Series.

Adjoining to the wax series; including the chief oils and fats used in the arts. Their purification; manufacture of soap and candles, stearine, stearic acid, &c.

12.—Shell Series.

Placed opposite the horn series. Mother-of-pearl shells, as imported, and the same cut and polished. Uses of shell for ornament, inlaying on papier-maché, &c.

13.—Refuse Matters.

Arranged on the shelves adjoining to the shell and oil series. Refuse animal matters derived from the previously illustrated arts, showing the uses to which they are applied. Manures; manufacture of ammonia, prussiate of potash, phosphorus, &c.

⁂ Several of the minor series are not exhibited for want of space.

SUPPLY OF CAOUTCHOUC.

Mr. Thos. Hancock, in a letter to the *Gardener's Chronicle*, calls attention to the vast and increasing consumption of caoutchouc, owing to the numerous new applications of it both here and in other countries. He says:—"The supply has hitherto been equal to the demand, but as the best quality is obtained from South America, and I believe from the *Siphonia elastica*, I beg to inquire whether this plant may not be cultivated in Jamaica and the East Indies, and if so whether attention should not be called to it in due time, since any chance that may obstruct the trade or diminish the supply, if obtainable only from one source, may cause great inconvenience. * * * It is clear that whether obtained in the solid or liquid state, this substance is destined to take an important place in the manufactures of this country;" and he desires to direct the attention of competent persons to the cultivation of the plant in our own colonies and elsewhere.

TEMPERING OF STEEL.

In the discussion on Mr. Sanderson's paper, "On the Manufacture of Steel," an inquiry was made as to the kind of steel suitable for particular articles, and how its quality might be tested. This gave rise to the remark that the tempering of steel depended on the skill and experience of the workman. Mr. Harry Scrivenor, of Liverpool, has, however, obtained from a clever workman the following memoranda on the subject:—

"I received your letter inquiring what steel was best for different kinds of manufactures. I should say cast-steel, if it can be applied; double shear for hatchets, or any kind of edge tool that cannot be well made of cast-steel. The temper to be as follows:—

"1st. For boring cylinders, turning rolls, or any large cast iron, let it be as hard as water will make it, minding not to heat it more than a cherry red.

		Degrees. Fahr.
2nd.	Tools for turning wrought iron, pale straw colour	430
3rd.	Small tools for ditto, shade of darker yellow	450
4th.	Tools for wood, a shade darker	470
5th.	Tools for screw taps, &c., still darker straw colour	490
6th.	For hatchets, chipping chisels, brown yellow	500
7th.	For small rimers, &c., yellow, slightly tinged with purple	520
8th.	For shears, light purple	530
9th.	For springs, swords, &c., dark purple	550
10th.	For fine saws, daggers, &c. dark blue	570
11th.	For hand and pit saws &c., pale blue	590

"The temper greatly depends on the quantity of carbon that is in the steel—this the practical man soon finds out, and he tempers or draws down his tool accordingly."

Home Correspondence.

REFORMATORY SCHOOLS.

SIR,—Having been obliged to leave on Wednesday evening before I had an opportunity of speaking, I hope you will favour me with space for a few remarks.

The terms *harsh* and *vindictive* were much employed by some, in reference to the infliction of punishment on young persons convicted of crime, before they are sent to a reformatory school. I think, sir, that these terms ought not to be so applied. No one proposes that punishment should be administered in a vindictive spirit. If such views ever were entertained by any, they are now universally abandoned. All are agreed that the only legitimate object of punishment inflicted by man is, to deter from the commission of crime. And so also with the terms *cruel, harsh ;* no one desires that punishment should be in the least degree more severe than is necessary to effect its object; no one desires to injure the health, bodily or mental, of the individual subjected to punishment; our only objects are to prevent him who is punished from repeating the offence, and by the example of his punishment to deter others. I conceive, therefore, that while it may be a fair subject of question, whether certain kinds of punishment may not be unnecessarily severe or injurious to health, the use of such terms as "harsh" and "vindictive," is a complete misrepresentation, or begging of the question.

Much stress is also laid on this argument—that it is unjust or unfair to punish young persons who may be considered as having acted without discernment, and who have been placed in circumstances in which it was next to impossible to avoid being led into crime. This ground appears quite untenable if we view the object of punishment rightly, as simply preventive. Our proper inquiry, then, is, not whether the individual was or was not conscious he was acting wrong, not whether he could or could not have avoided committing the offence, but whether punishment is not necessary for the protection of society, by deterring the individual himself, or others. Even if it can be shewn that the youth convicted of crime could be thoroughly reformed without the infliction of any punishment, society is still justified in punishing for a breach of its laws, if the absence of such punishment may lead others to crime. We are continually led astray in such questions by the endeavour to carry out certain refinements, suitable for some, but as yet very unfit for the generality—by the endeavour to push certain abstract principles into summary operation, and make them override considerations of expediency in existing circumstances. Society condemns to hard labour, to perpetual imprisonment, or takes away life, in its own protection; we deliberately inflict pain on the unintelligent brute creation with the view of training them to or from certain habits; the tender parent uses the same apparently harsh means to bring the unintelligent infant to a right course of conduct; surely, when we consider these things, we must admit that however reasonable and humane it may be to make every possible allowance for circumstances which have forced a child into crime, it is rather going too far to urge society to abandon, on such grounds, a powerful means of preventing crime. Abstract natural rights are given up, as Burke says, when men enter into society, and "the whole organization of government becomes a consideration of convenience."

Connected with this subject, it was asserted by one of the speakers that the notion is fast dying away that it is impossible to conduct schools without "this sharp punishment," referring, I suppose, to corporal punishment. This is not the place to discuss this subject, but I do not think the notion alluded to is dying away. Schools are now, happily, conducted without that frequent, violent, and barbarous corporal punishment which prevailed in old times; and some select schools, I admit, may be successfully conducted without this sharp means of maintaining discipline. I believe, however, the generality of teachers will agree with me, that in most schools where corporal punishment is entirely abandoned, the discipline is lax, the progress of all (except a few of the best) inferior, and the tear and wear of the teacher very great.

We are in this dilemma, sir, as to reformatory schools. If we desire to effect a thorough reformation, we must touch the heart by a kind parental treatment; if made thus agreeable to the inmates, they operate as an inducement to the commission of crime.

That a kindly treatment is necessary, if we desire to produce a thorough reformation, is proved alike by theory and by experience. If we inquire into the circumstances of those children of all classes that do not become criminal, we shall find that they are placed above the reach of want, that their time is occupied by some useful pursuit, that religious influences are brought to bear on them, and that they are operated on individually by the influence, advice, conversation, and example of affectionate and intelligent parents. These are the causes which, acting during a long series of years, generate a character and habits which preserve our youth from vice. Is it not reasonable to suppose that if we place young offenders in similar circumstances, as nearly as may be, we may reclaim very many of them, and send them forth to be useful and creditable members of society? And accordingly, experience confirms this opinion. At the great reformatory institutions of the Rauhen-haus, near Hamburgh, and at Mettray and Petit-Bourg, in France, it is found that from 80 to 90 per cent. of those sent out have been thoroughly reclaimed, not more than 10 to 20 per cent. relapsing into vicious courses; and as these institutions are but in their infancy, it is not unreasonable to hope that they may in time be attended by a still larger measure of success. They have attained the great success that has hitherto characterised them by making the nearest possible approximation to the method of a well-regulated family,—a small number of youths (from 12 to 20) being under the direction of one "father," or "chief," and constantly under his eye. Education for a few hours daily, industrial occupation, religious training, and unremitting friendly or fatherly influence of the "father" or "chief," continuing from periods varying from two to five years, with assistance in procuring a situation at leaving, and the continuance of friendly intercourse afterwards by correspondence and occasional visits, are the means by which, in these celebrated institutions, four-fifths of the youth trained in them have been permanently reclaimed from vicious courses, and rendered useful and respectable members of society.

There cannot be a doubt, from the experience of these institutions, and of our own reformatory schools, that the preceding reformatory methods may be rendered thoroughly efficient for their purpose; and the great fact is thus established, that young offenders may be reclaimed; and it is further established, that this may be done at an expense very far below what they will cost the country if permitted to run their usual course of vice and crime.

But there is too much reason to apprehend, with Mr. Symons, that the comfortable and happy condition of the inmates of these reformatory institutions may operate as direct inducements to the commission of crime. No satisfactory answer seems to have been given to what was so forcibly stated by Mr. Symons and Mr. Elliot on this head. Lord Lyttelton, indeed, urged that it is "in itself a punishment to a child who had been brought up all his life in lawless habits, to be taken to one of the reformatory institutions, where he was obliged to conform to habits of regularity, and to pursue a system of hard labour only." And in an able article on the subject in the last number of the *Edinburgh Review,* this is the only answer given to the objection in question,—a very insufficient reply, for it is only a conjecture at best; and it is certainly at variance with everything we know of human nature to suppose that numbers of those in the wretched and precarious condition which tempts to crime, will not look with longing eyes on the secure, comfortable, and happy homes which the reformatory institution holds out; that is, if it be one such as I have spoken of as alone capable of effecting a thorough reform.

The evil, I apprehend, cannot be entirely removed. As a measure of economy, policy, and humanity, we must have reformatory institutions; and to do their work well, they must be made, on the whole, agreeable to the inmates. To palliate the evil of the temptation to crime thus held out, only two means appear likely to have any considerable effect,—*first*, "a due prefatory period of punishment for the offences of which they are convicted," as advocated by Mr. Symons; *secondly*, wherever it is possible, holding the parent responsible for the child, and making him contribute to its maintenance in the reformatory institution.

In conclusion, I would urge upon all who are interested in this subject the study of the methods that have been so successful in Switzerland, Hamburgh, France, and Germany. It is not in large establishments, with hundreds under a few teachers or superintendents of work, on the wholesale principle of "slumping 'em all together," that the work of reforming the heart and habits can be carried on. In this great and difficult task, we must operate on the individual by placing a few under the constant, kind, and anxious care of one who acquires their love and esteem. It is thus that in the family children are preserved from vice; it was thus that Wichern and Demetz met with their extraordinary success; and we must follow these great examples if we would not lose our time, and pains, and cost, by sending them forth half-reformed, ready to relapse into vice on the first temptation.

I am, Sir, yours, &c.
HUGO REID.

Greenwich, May 7, 1855.

PRINCIPLE OF A DECIMAL COINAGE.

Sir,—An opinion is widely spread, even amongst those who are friendly to an alteration in our currency, that the adoption of a decimal system will require the use of *decimal fractions* by those who keep accounts. That this opinion is unfounded will be seen from the following observations.

A *perfectly* decimal notation of money, weights, and measures should be identical with that of abstract numbers, only adding the word cash, weight, length, surface, or solid, &c.

NOTATION TABLE.

Unit	1	a cash, a weight, &c.
Ten	10	ten cash, ten weights, &c.
Hundred	100	a hundred cash, &c.
Thousand	1,000	a thousand cash, &c.
Ten thousand	10,000	ten thousand cash, &c.
Hundred thousand	100,000	a hundred thousand cash, &c.
Million	1,000,000	a million cash, &c.

Instead of *several* units of cash, weights, or measures, there ought to be in accounts but *one* unit, to correspond exactly with the preceding table.

The *coinage*, on this principle, should be adapted to the notation, instead of the notation being made to agree with any particular system of coinage.

The unit of cash being determined on, every piece of money should be stamped with *the number of cash* it represents, as 1-cash, 5-cash, 10-cash, &c. Arbitrary names for coins are unnecessary, since all accounts would be legally rendered *in one denomination only*, namely, "cash." The names pound, shilling, &c., would still be popularly applied, but would appear in calculations as so many "cash;" for example, 1000-cash, 50-cash, &c., respectively.

The *coins* should severally represent the simple factors of 10, or multiples of them by the powers of 10; as 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, &c.

The stumbling block in the way of decimalising our present currency is the impossibility of obtaining a unit which will comprise the penny and the pound in the same system, without altering the value of one or the other. It will be seen in Table I., that if the penny be left unaltered, the pound sterling will have to be excluded from the decimal system, and also the present silver and gold coinage will have to be withdrawn.

Table II. shows that but a slight alteration in the value of the penny sterling is required, to include decimally not only the pound, but nearly all the other existing coins.

TABLE I.

12 pence = 1 shilling; 240 pence = £1.

Existing relation between *penny* and *pound* undisturbed.

1.			2.			3.		
Units.	s.	d.	Units.	s.	d.	Units.	s.	d.
1	0	0¼	2	0	0⅕	5	0	0¼
2	0	0½	5	0	0½	10	0	0½
5	0	1¼	10	0	1	20	0	1
10	0	2½	20	0	2	50	0	2½
20	0	5	50	0	5	100	0	5
50	1	0½	100	0	10	200	0	10
100	2	1	200	1	8	500	2	1
200	4	2	500	4	2	1000	4	2
500	10	5	1000	8	4	2000	8	4
1000	20	10	2000	16	8	5000	20	10
960 = £1			2400 = £1			4800 = £1.		

TABLE II.

50 farthings = 1 shilling; 1000 farthings = £1.

Relative value of farthing reduced 4 per cent.

4.		5		6.	
Units.		Units.		Units.	
1	1f.	2	2f.	5	1f.
2	2f.	5	2½f.	10	2f.
5	5f.	10	5f.	20	4f.
10	10f.	20	10f.	50	10f.
20	20f.	50	Sixpence	100	20f.
50	Shilling	100	Shilling	200	40f.
100	Florin	200	Florin	500	Florin
200	4 shillings	500	Crown	1000	4 shillings
500	Half sov.	1000	Half sov.	2000	8 shillings
1000	Sovereign	2000	Sovereign	5000	Sovereign
1000 = £1.		2000 = £1.		5000 = £1.	

By increasing the value of the copper money twenty per cent. a third table might be formed, which would give 100 units = 6d., and 1000 units = a crown.

It will be easily seen that every "system" which has been proposed approximates more or less to one or other of the above schemes. The late Mr. Laurie's plan will be recognised as a near approximation to Number 2. The balance of advantages, however, seems decidedly in favour of Number 4, which requires no alteration in the coinage. We have only to recollect, in popular terms, that the penny-piece is to count for *five farthings*, and a shilling for *ten pennies*. Thus we have the following :—

SCHEME FOR A DECIMAL CURRENCY, TO INCLUDE THE EXISTING COINAGE.

The unit of account (a "cash") to represent 1¾ grains of silver. Its copper substitute to weigh 40 units, *i.e.*, 70 grains.

100 Cash to make 1 Cent, or Florin.
10 Cent to make 1 Mil, or Pound.

COINS.		VALUE.
Copper—		
Farthing	May remain current, and count as . .	1 Cash.
Halfpenny		2 „
Penny-piece		5 „

SILVER—		
10-Cash piece, to count as . . .	10	„
20-Cash piece	20	„
50-Cash (Shilling)	50	„
CENT* (FLORIN)	100	„
2-Cent piece	200	„
GOLD—		
5-Cent (Half Sovereign). . . .	500	„
MIL (POUND)	1000	„

The "sixpence," halfcrown, and crown may continue in circulation as temporary coins, counting 25, 125, and 250 respectively.

Since the copper tokens merely serve as counters, with little or no relation to the intrinsic value of copper; the penny-piece being made to count for *five*, instead of *four*, would cause no pecuniary disturbance, while the advantage, decimally considered, would be immense. Two half-pence, or four farthings, will still represent a penny *sterling*.

I remain, sir,
Your obedient servant,
SAMUEL A. GOOD.

H.M.Dockyard, Pembroke Dock, April 30, 1855.

REMARKS ON MR. EDWIN CHADWICK'S VIEWS ON INDIAN IRRIGATION.

SIR,—Colonel Cotton applied a very happy and strictly parliamentary epithet to Mr. Ayrton's crude notions on irrigation, when he called them "curious," but the Indian lawyer was outrun by Mr. Edwin Chadwick's closing speech on the same subject. Mr. Chadwick gravely proposes that the main and lateral channels of Indian irrigation works, when not used for navigation, should be arched over, or turned into tubular drainpipes, and that the water should be applied to the land by a hose and jet, worked, I presume, by steam-power where the power of gravity is not sufficient; and he takes his examples from South American and Persian valleys, and two or three strictly exceptional fancy farms in this country. Why, even if the system were (except in dairy farms) profitable, he might just as well recommend that the Indian peasantry should be clothed in high-lows, leather leggings, and smockfrocks, and that half-a-dozen of Howard's ploughs, and one of Crosskill's clod crushers should be supplied to every five hundred acres in the Godavery delta before any cultivation was permitted.

It is quite clear to me, who have seen the best specimens in England of irrigation by water meadows and liquid manuring by hose and jet within the last twelvemonths that Mr. Chadwick's ideas on the subject are derived from experiments on the smallest scale in flower-pots and cucumber-frames with a hand squirt.

Just look at the magnitude of the undertaking—twelve hundred thousand acres of flat land are irrigated in the delta of the Godavery in less than two days by minor streams led from one thousand miles of water communication. With no other help than their rude ploughs and hoes the Indian cultivators manage to lead the water through every yard of their fields—this water, heavily charged with alluvial soil, acts both as manure and refreshing rain for grain crops, seeds, trees, &c. The land is simply moistened from time to time, *for rice it is essential to keep* the ground covered with a thin stream for many successive weeks.

To water 1,200,000 acres would take something like 7,000 miles of drains and pipe, joined and laid most skilfully at the exact inclination required for a continuous flow. If it were possible to find the money, and the pipes, and the workmen, the pipes would be filled up in less than a month in numberless directions by the soil in solution which forms the manure. Instead of the Indian with his hoe, leading the stream as he wanted it, there must be forty or fifty steam engines, and the native peasant, who can with difficulty be induced to use a European corn mill or wheelbarrow, or any European instrument, is to have, instead of a hoe, a hose and jet put into his hand. At present the whole delta can be watered in two days; how long it would take to squirt the water required through an inch bore pipe, I must leave the Board of Health to calculate. But after all, no pipes, hose, and steam jets, however perfect, can supersede the water meadow system for rice meadows or for grass meadows, because quantity and covering are essential. As to India, it is quite unnecessary to discuss the question. To do anything on a large scale we must work with the tools of the country, and although we may introduce into main channels of irrigation, any works suggested by the modern lights of science and experience, we must let the Indian cultivators work in their own way if they are to raise any crops at all.

The probability is that Mr. Chadwick, whose ability no one can dispute, although it is lamentably dimmed by the credulity with which he accepts any evidence from any quarter favourable to his views, was not thinking seriously of India at all, but of England, where for some ten years he has been labouring, without making any real progress, to substitute liquid manure for solid, and town sewage for the portable manures we owe to the guano islands and the discoveries of our chemists. This inference is borne out by his having inserted in the report of his speech a table, which has already done duty in the collection of fallacies issued by the Board of Health as "minutes on the subject of sewer water and town manure." This table can have no possible bearing on Indian irrigation, where the style of agriculture is as different from English agriculture as the cost of labour of coal and iron are from English prices.

This table was prepared by Mr. Superintending-Inspector Lee, in December, 1851, since which many remarkable changes have taken place. I have followed in Mr. Lee's footsteps over some of the principal farms mentioned, and have found his calculations, and still more his conclusions, based on statements as hypothetical as those of a traffic-taker for an intended railway. As this table has been circulated in the *Journal of the Society of Arts* as an "official document," when it really deserves no more weight than as the opinion of an engineer in the employ of the Board of Health, I have a right to dissect it.

First, then, the Duke of Sutherland's Trentham farm, quoted as an example of hose-jet irrigation, was incomplete, and had produced no results when Mr. Lee visited it, consequently, his calculations of the expense are mere guess-work. Mr. Lee has put down just what he pleased for machinery, coals, and wages of labour, so of course he obtains exactly the annual expense he requires. The next instance is Halewood, Mr. Neilson's farm, and there I will be content with saying that none of Mr. Neilson's friends will think of referring to Halewood as an instance of successful farming. Next comes Liscard. I was at Liscard last year. The whole arrangements of that farm —a pretty fancy farm—were designed and executed under the direction of a friend of mine, Mr. William Torr, the well-known short-horn and Leicester sheep breeder, of Aylesby, in Lincolnshire.

At Liscard liquid manure is only employed for growing Italian rye-grass, distributed by hose and jet. Not a drop is applied to corn, although it might with ease. Mr. Littledale largely employs solid farm manure, guano, and phosphates, on his. Mr. Torr has laid out several other farms, besides two which he farms himself at Aylesby, where he has remodelled and rebuilt all the farm buildings. He has not, either in his own or in those he has designed for others, adopted the pipe and jet system, because, he told me, "it would not pay, except for growing a mass of green crops for a dairy." Now Mr. Torr is not only a modern improving farmer, but a very clever mechanic. For further particulars I refer your readers to the discussion on the subject of the cost of liquid-manure irrigation, at the Royal Agricultural Society's Rooms, last year, when the late Sheriff of Lincolnshire reported on the cost of irrigation on the Scotch farms.

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* The application of the words "cent" and "mil," as brief synonyms for "hundred" and "thousand" respectively, might be extended with advantage to weights and measures as well as to cash, *e.g.*,

100 weights make 1 cent.
10 cent make 1 mil.

So that, adopting the *unit of weight* proposed by me in the Journal of the 2nd of June last, a "mil-weight" would equal 4 oz.; and four "mil-weights" a pound avoirdupois. A uniform mode of expression might thus be made to prevail throughout the whole decimal system.

As to Mr. Lee's capacity to form an opinion on agricultural irrigation, I will only mention one illustration of it. I was at Exmoor water-meadows, mentioned in his report, three years after his visit. There a spring, brought from a hill above the farm, has been made by my friend, Mr. Robert Smith, to irrigate about eighty acres of a sloping hill behind the grange, after imbibing the manure of the farmyard and house, with admirable effect on the grass. Eighty acres are flooded in a quarter of an hour with no other machinery than a man, two boys, and three spades, as the water flows always down hill. Mr. Lee, like Mr. Chadwick, has such a superstition in favour of tanks, pipes, and hose, that he actually recommended Mr. Smith, much to his amusement, to substitute elaborate machinery for his effective rivulet running down a hill. He repeats the same suggestion in the report I have been dissecting. It must be noted that Mr. Smith confines his liquid manure stream to grass crops—roots and oats he treats with solid. In the report on Somersetshire, published by Mr. Thomas Acland, a member of this Society, and one of the Editors of the Journal of the Royal Agricultural Society, he describes water meadows made at from 20s. to £5 per acre.

The official reports of the Board of Health, quoted by Mr. Chadwick with an authority to which they have no title, would lead to the conclusion that the use of liquid manure, underground pipes, hose, and steam-jet are rapidly superseding water-meadow irrigation, solid farmyard manure, and the portable manures of Peru and of chemists. This is not the case. Never was there a time when farmers more readily and more rapidly adopted real improvements, whether chemical or serial; but the use of sewage manure is not making progress, because the chemists and the guano merchants have beaten, and will beat, night-soil out of the market in every shape. Green crops are the only crops to which the hose-and-jet application of liquid manure has proved decidedly economical. An excellent paper was read on this subject at the Farmers' Club in March last, by Mr. Morton, of the *Agricultural Gazette*. I have taken this opportunity of expressing opinions unanimously held by a large body of agricultural friends, who see with regret your *Journal* made the medium of disseminating the errors of a Commission which is virtually irresponsible.

Yours, &c.,
SAM. SIDNEY.

Central Farmers' Club, Blackfriars.

PUBLIC WORKS FOR INDIA.

SIR,—The time of the meeting of the Society on the 7th instant was unfortunately so much taken up by gentlemen speaking on matters that did not at all affect the great question under consideration, and by the same gentlemen who on the previous evening occupied so much time in discourses on the advantages of high-speed railway, which nobody denied, that only one or two of the gentlemen who wished to speak on the real question had an opportunity of doing so. I had also reckoned upon an opportunity of making some further remarks on the main points I had brought forward, but, in consequence of the turn matters had taken, it seemed to me that there was no alternative, at so late an hour, but for me to make merely such remarks as were required to show the entire ignorance of the whole subject of Indian civil engineering which the speeches of my opponents displayed.

I beg now, therefore, to add a few things which I could have wished to have said at the meeting.

I must first premise that not one word was said by either Colonel Sykes or by the railway men, that in the least degree met my main positions, viz., 1st, that nothing like a complete system of works had been yet executed or even proposed in India; 2nd, that it was a most grievous mistake to spend £10,000 a mile upon communications, while the same money and time would produce 50 or 100 times as much useful effect if spent upon the natural openings for improvement which the country presented; and 3rd, that the railways could neither carry the quantity nor at the cost that the country required, and that could be carried by other means. Colonel Sykes had, as usual, mentioned various works, and then said, "and yet Colonel Cotton had said in his paper that nothing had really been done towards two great objects, viz., irrigation and opening up the resources of India." But this did not dispose of the notorious fact that I had brought forward, viz., that those were only isolated works, and that the great mass of the country, nine-tenths of it, was still untouched. Let us take, for instance, Madras. A railway is commenced, which gives one line of communication through 5 districts out of 24, of which Madras consists Does this provide even the districts it passes through with communications, and how does it affect Ganjam, for instance, which is from 500 to 700 miles from the nearest end of it. Again, will the irrigation and water transit in the deltas of the Godavery and the Kistnah, provide for the district of Bellary in the centre of the peninsula.

Again, I gave an instance of the effect of money laid out in a more judicious manner in the delta of the Godavery, stating the enormous results already obtained, before the works have produced one-tenth of their proper effects, before they were even finished, and pointed out how insignificant, compared to that, would have been the effects of the same money laid out in such works as are at present constructing. The only sort of answer attempted to such unanswerable facts as these, was Mr. Ayrton's curious theory that, whatever it *did*, irrigation *ought* not to prevent famine. When, in reply to this, I stated to the meeting what Indian irrigation was, Mr. Ayrton answered that he had not been speaking of deltas, but of the upper country; he did not know that the sketch I gave of river irrigation was of universal application, and was just as much suited to the upper country as to deltas. So dangerous is it for men to meddle with matters about which they are not at all conversant, that their very explanations only show more distinctly their want of knowledge of the matter. Further, I stated the cost of transit by different modes, and showed the cost to which transit might be reduced by means of steam and water, compared with the cost on railways if worked at high-speed.

No answer could be given to these things, which were the real points on which the subject turns; so all my opponents were under the necessity of wiling away the principal part of the evening in talking of the advantages of railways, &c., which nobody denied. They are certainly excellent things in the abstract, and consequently they are so in their proper places, but where they prevent our doing what is really wanted, they are, properly speaking, mischievous. Two years ago the following passage was written: "If a railway on an important line is constructed on so expensive plan as to require a high rate of charge to enable it to pay a good interest, an irreparable evil will have been done; and the whole power of an influential body, (influential and powerful just in proportion to the amount of capital expended) will be brought to bear on that line, *not* in order to secure cheap transit, but to prevent cheap transit ever being obtained on it." How exactly this has been fulfilled these discussions have proved; the moment a man proposes cheap means of obtaining cheap transit, the old tribe of opponents to improvement are almost entirely pushed aside by the vehement railway men, in their anxiety to throw dust in men's eyes and prevent the subject being investigated.

I must not, however, omit to allude to one real answer to one of my positions, viz., that brought forward by an eminent engineer, who has had experience in Indian public works, Sir Frederick Abbott. His question was, Can Indian rivers be improved? This is an intelligent and fair question, and *must* be answered. I answer first, that several rivers are now navigated at rates which there seems no hopes of the railways now contending with. And secondly, that from my experience, I have no doubt that they can be improved. It is impossible to enter into the detail of this here; and I must beg to refer those who are willing to look into it, to my published papers, where the point is pretty fully discussed. I may also mention, that one experiment has been made in the Jumna, where, by closing the irrigating canals, and thereby turning an additional half-million of cubic yards per hour into that river, the depth of water in it was increased 14 inches; so that, supposing the depth before to be at the fords 2½ feet, this increased it to nearly 3¾ feet—a depth which is sufficient for large river steamers. Now the cost of storing water to supply that quantity per hour for so many days can easily be calculated from the data we have in India. This is one way of improving rivers. A good deal may also be done by operating upon their beds, as is now regularly done every year in the Ganges. I have stated in my paper that the government of Madras were now at work in the Godavery, improving its bed for navigation. Sir Frederick also doubted whether large steamers could ever be run on the rivers or canals of India. He was not aware that at this moment large boats, of 400 tons burden, are towed on the Ganges. The large steamers on the Hudson, with a speed of twenty miles an hour, only draw 4½ feet of water, while the depth of the Ganges canal is 10 feet at its head.

I must also advert here to one or two other points. One is the state of the case in respect to the defence of India. This in no respect differs from the commercial view of the question. It is as much for the advantage of the movement of troops that they should be enabled to go 1,000 miles at 10 miles an hour, rather than 100 or 20 at 30, and the remainder by daily marches of ten miles, as it is that goods should be moved cheaply over a long distance, rather than quickly and dearly for short ones. The defence of India will be much better secured by 20,000 or 50,000 miles of communication, with a speed of 10 miles an hour, than by 4,000 or 5,000 at a speed of 30.

Again, it is supposed that irrigation must wait for communication, whereas irrigation stands on its own legs. Whether produce is confined within the limits of a country, a village, or a single field, it should equally be raised by means of irrigation, because it can be raised cheaper than without. A man should, of course, irrigate his garden if he finds that one man can with water do the work of two without, though he never sells a cabbage.

After settling the fundamental principles of this great question of public works for India, such as whether very speedy transit over a few lines, or very cheap transit with a moderate speed over a great extent of line, is most required in the present state of the country; whether we should throw away our immense natural advantages because England, for want of them, has had no alternative but to spend such enormous sums; what I wish to see is the formation of a Board at each Presidency, carefully selected, consisting only of three or four members (because action is the main thing required), one of them an engineer, one from the Civil Service, and one or two non-professional men, all men of talent and judgment, and young enough to be in full possession of their energies, with nothing whatever to do besides the business of thepublic works. To dream of such a vast work being sufficiently investigated by men who have twenty other things to attend to, like the Councils, is palpably absurd. The Governor in Council must of course decide all questions, but they ought to have a body of men to digest the questions, who have made themselves well acquainted with the whole subject, and are capable of forming a sound opinion on such matters. The Council at Madras once rejected a lock, because they objected that it would detain the boats till high-water, and when opened, would let the water out of the canal, not knowing that *the object of a lock was to let the boats pass and retain the water*; and this is a good specimen of the consequence of leaving matters in the hands of those who are necessarily without any materials in their own minds for forming a judgment on them.

When such a Board is formed, then they may proceed to take a comprehensive view of the whole Presidency, and with maps and models before them, showing the heights of all the populous parts of the country, with statements of produce, prices, &c., and other materials, there will be rational grounds for expecting that they will be able to sketch a complete system of public works really suited to the country, bringing within its influence every district, and taking advantage of all natural facilities. A rough estimate of the total cost may then be made, and those works selected to commence upon which will give the greatest relief to the country with the least expenditure of time and money. It is surprising to see, when a matter is thus taken up deliberately and systematically, how much may be effected at a small cost. We have abundant proof from actual results already obtained from public works in India, that the forty millions proposed to be expended in such a comparatively insignificant work as 4,000 miles of railway, which people hope may return 5 or 10 per cent. to the shareholders, and which may return a total profit to the community of 10 or 20 per cent., that this forty millions, if expended upon the most remunerative works, would have yielded a total profit of from 100 to 200 per cent. On making such an investigation, it would soon be discovered that there were natural openings where small sums would produce proportionately vast effects, such as the improvement of the Godavery, which promises for the cost of ten or twenty miles of railway, to relieve 10 millions of people from an enormous loss. If only 100,000 tons a year were carried by it, the direct saving on 500 miles would be half a million a year, besides other benefits which cannot be estimated, from the passenger traffic, &c. So in Rajahmundry, £250,000 has been spent on the public works there, and before they are finished the district is selling £150,000 worth of produce a year beyond what it used to do, besides the increase of exports by land.

If such a systematic proceeding had been adopted it would have been, as it were, impossible that a project for carrying the produce of Berar over the Ghauts to Bombay, by a railway to cost millions, could ever have been entered upon, when there was a river both navigable and improvable at a small cost, flowing from the district to a safe port in the opposite direction.

I cannot but think that all unbiassed persons will agree that common sense requires that some such systematic mode of proceeding as I have now ventured to suggest should have been adopted.

If there were nothing else in the case, to see the English capitalists wasting their money upon such works, when there is an unbounded field for the employment of capital in such a way as would yield at least four or five times as much interest, is grievous enough. Even in England the railways have, upon the whole, failed as a speculation, wealthy as the country is. How obvious it is that in India a million spent upon 500 miles of inferior communication would pay better than the same sum spent upon 100 miles of high-speed railway. But not only have the authorities neglected to ask the question, Will this mode of proceeding produce the greatest proportional relief to the country? but even the shareholders have not asked so obvious a question, in respect of their own interest, as, Will this mode of spending money on public works in India return us a greater interest for our money than any other?

I feel assured that this subject cannot be much longer kept out of sight, and that the opportunity which the Society of Arts have so kindly afforded me of bringing forward my views on it, will help greatly to hasten a full investigation of it, which is all that is required to burst the bubbles with which we have hitherto been amused on the great question of Indian improvement.

But the most important point I have to notice is the following. In my paper, I said that public works lie at the foundation of the improvement of the people, *not only material but moral.* The mail which has since arrived, brings us the intelligence that "24 villages in one of the *Talooks* (tracts containing perhaps 100 villages) of the Godavery delta proposed to the revenue officer, Mr. Taylor, to defray the cost of maintaining schools *by a fixed annual addition to the Government land tax,* which should form a permanent allowance, and be applied to educational purposes." The Government have approved of this, and added a sum for inspecting-masters, &c. Part of the remarks of the editor of the *Madras Athenæum* on this is as follows:—"In Rajahmundry, irrigation works have for some time fertilised the land, nourished the people, and increased the resources of the country. That district may, therefore, be taken as a favourable result of the British rule, as applied to the soil of the country, and of the effect ordinary comfort produces on the minds of the people. What do we find? That the people actually propose to tax themselves to obtain a superior education for their children." This is what Mr. Taylor says:—"The most thriving communities will naturally be the most forward in the march of improvement, and as might be expected, *the ryots of those villages which have abundantly benefitted by the irrigation works are the first to come forward to beg permission to contribute towards the expense of their children's education.* The spread of sound vernacular instruction throughout the villages may eventually be not the least among the indirect effects of the works of irrigation."

As proofs of the agreement with my views respecting the Godavery, I quote two extracts from the two leading journals of Calcutta and Madras. The *Friend of India* says, that the opening of the Godavery by clearing the obstructions to its navigation is the province of Government, and suggests that funds be at once placed at the disposal of the Madras Government for the rapid prosecution of the necessary operations. And the *Athenæum* says,—"Our object has been to dissuade the Government from locking up money in the railway scheme, principally, seeing as we did, that the advantages of the Godavery project were such as could not be overlooked, and that the river must ultimately beat the rail, we were desirous that money which might ultimately be usefully employed in opening up other portions of the Indian empire should not be laid out on a line whose object could be far better answered at a far less cost."

These extracts show that the papers that have been published on this subject in India have pretty well satisfied the heads of the fourth estate there that the project is not quite the contemptible thing that Mr. Ayrton endeavoured to represent it.

I remain, yours faithfully,
A. COTTON.

To Correspondents.

In addition to several articles noticed last week as being in type, and still omitted from want of space, the following have been received:—Mr. David Mushet, "On Mr. Sanderson on the Manufacture of Steel;" Mr. Samuel Sidney, "On 'Prices;'" Hon. R. Temple, "The Resources of British Honduras."

MEETINGS FOR THE ENSUING WEEK.

Mon. Geographical, 1 p.m. Annual Meeting.
Actuaries, 7
Architects, 8.
Tues. Royal Inst. 3. Dr. Tyndall, "On Voltaic Electricity."
Civil Engineers, 9. President's Annual Conversazione.
Wed. Royal Inst., 3. Dr. Du Bois Reymond, "On Electro-Physiology."
Society of Arts, 8. Messrs. Mather and Platt, "On Earth-Boring Machinery."
Geological, 8. 1. Mr. P. W. Greves, "Notice of the occurrence of a bore at Port Lloyd, Bonin Islands." 2. Mr. D. Sandison, "Notice of the occurrence of an Earthquake at Broussa, on April 11th, 1855." 3. Mr. K. Godwin-Austen, "On the Extension of the Coal Measures beneath the South-eastern parts of England."
Thurs. Royal Inst. 3. Mr. G. Scharf, jun., "On Christian Art."
Fri. Botanical, 8.
Royal Inst., 8½. Dr. Tyndall, "On the Currents of the Leyden Battery."
Sat. Asiatic, 2.
Royal Inst., 3. Dr. Du Bois Reymond, "On Electro-Physiology."
Royal Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. No.

Delivered on 17th May, 1855.

68. Finance Accounts—Classes 1—7.
171. Election Auditors, &c., and Election Expenses—Returns.
217. Exchequer—Account.
126. Bill—Hardware, &c., Manufactures.

Delivered on 18th May, 1855.

195. Railway (Balaklava to Sebastopol)—Copies of Correspondence.
231. Metropolis Main Sewers—Return.
158. Education (Minutes of Privy Council in Chronological Order, &c.)—Return.
212. Stores for the East—Return.
76. Bills—Court of Session (Scotland).
122. Bills—Bills of Exchange and Promissory Notes (as amended by the Select Committee).
124. Bills—Coal Mines Inspection.
127. Bills—Mortmain.
Australian Colonies (Alterations in the Constitutions)—Further Papers.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, May 18th*, 1855.]

Dated 23rd April, 1855.

902. H. Balan, Paris—Transporting passengers and goods.
904. J. Wright, 12, Sussex-terrace, Islington, and E. Brimble, 32, Cheapside—Stays or corsets.
906. A. Jenkin, Zell-on-the-Moselle—Furnaces for the reduction and calcination of lead and copper ores.
908. W. Gossage, Widnes—Soap.

Dated 30th April, 1855.

964. R. Burns, Liverpool—Propelling vessels.
966. J. Walworth and D. Taylor, Manchester—Stand pipe for hydrants.
968. A. Buchanan and J. Barclay, Catrine, N.B.—Finishing textile fabrics.
970. P. Dépierre, Paris—Dyeing. (A communication.)

Dated 1st May, 1855.

971. T. Torbitt, Belfast—Treatment and preparation of potato.
972. T. Hunt, Crewe—Permanent way.
973. W. Eassie, Gloucester—Stopping railway trains.
975. W. Hartley, Bury—Safety valves.
976. J. E. Boyd, Lewisham—Ship's course indicator.
977. G. Fisher, Cardiff—Railway buffer.
978. L. W. Wright, Birmingham—Locks.
979. W. and J. Banks and H. Hampson, Bolton-le-Moors—Bleaching yarns.
980. R. Adcock, Wolverhampton—Purifying alcoholic liquids. (A communication.)
981. W. Hemsley, Melbourne, near Derby—Cutting warp fabrics.

Dated 2nd May, 1855.

983. T. Lambert, Harrington-square—Pianofortes.
984. F. W. Harrold, Birmingham—Frames of slates. (A communication.)
985. S. W. Campain, Deeping Fens—Filling sacks.
986. H. Lee, jun., Lambeth, and J. Gilbert, Hackney-road—Mixing concrete.
987. T. R. Bridson, Bolton-le-Moors—Finishing textile fabrics.
988. M. A. C. Mellier, Paris—Paper.

Dated 3rd May, 1855.

989. W. Basford, Penclawdd, Glamorganshire—Purifying coal gas, and obtaining useful residuum.
990. J. Burgess, jun., Birmingham—Comb.
991. W. Rowett, Liverpool—Fitting, handing, and reefing vessels' sails.
992. J. Platt, Oldham, and J. Taylor, Hollinwood, near Oldham—Looms.

Dated 4th May, 1855.

993. T. Horton, Birmingham—Charcoal and pyroligneous acid.
994. F. Fletcher, Birmingham—Water closets.
995. W. H. Marks, London—Signalling approach of vessels at sea.
996. R. Thiers, Lyons—Stretchers of umbrellas and parasols.
998. J. Lecassagne and R. Thiers, Lyons—Electrometric regulator.
999. J. Hamilton, jun., Liverpool—Iron girders.
1000. D. Dalton, Chester—Smelting furnaces.
1001. J. Trotman, 42, Cornhill—Screw propellers.

Dated 5th May, 1855.

1002. R. Midgley and G. Collier, Halifax—Preparing yarn.
1004. A. Brandon, Paris—Heating and warming apparatus.
1006. M. Butcher and T. H. Newey, Birmingham—Forge hammers.
1008. H. G. A. Pecoul, Paris—Generating power in steam engines.

Dated 7th May, 1855.

1010. J. Pearson, Totterdown, near Bristol—Fastening tyres on wheels.
1012. D. Foxwell, Manchester—Wire cards.
1014. E. Tyzack, Sheffield—Scythes.
1016. J. Hands, Epsom—Furnaces.
1018. J. H. Johnson, 47, Lincoln's-inn-fields—Paper and cardboard. (A communication.)
1020. J. H. Johnson, 47, Lincoln's-inn-fields—Prevention of smoke. (A communication.)
1022. J. Lewis, Holborn—Soap.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

1061. N. Brough, Birmingham—Slide buckles.—11th May, 1855.
1066. D. Caddick, Ebbw-Vale Iron Works, Monmouth—Puddling furnaces.—11th May, 1855.
1067. A. Warner, 11, New Broad-street—Combining sheets of copper or its alloys with lead, tin, zinc, nickel, gold, silver, platinum, or alloys containing these metals, or some of them, with or without the addition of copper, antimony, bismuth, arsenic, manganese, or mercury.—12th May, 1855.
1068. A. Guild, Manchester—Process of bowking.—12th May, 1855.

WEEKLY LIST OF PATENTS SEALED.

Sealed May 18th, 1855.

2451. Henry Diaper, Saint Michael's-terrace, Pimlico—The application of a new material to the manufacture of paper.
2453. Pierre Alexandre Dulaurens and Marie Anatole Laubry, Paris—Improvements in glove fixings or fastenings.
2461. Edmund Hunt, Glasgow—Improvements in screw propellers, and in ships or vessels.
2463. Jean Baptiste Bagary, Paris—Improvements in sawing apparatus.
2473. Charles Crickmay, Lozells, Handsworth—Improvements in single and repeating or revolving fire-arms, and in the mode of attaching bayonets to breech-loading fire-arms.
2491. Richard Roberts, Manchester—Improvements in machinery for preparing cotton and other fibres to be spun.
2503. Thomas Restell, Strand—Improvements in umbrellas, parasols, and cases or covers, and walking sticks.
2505. Alfred Vincent Newton, 66, Chancery-lane—Improvements in steam-boiler and other furnaces.
2508. Thomas Knight and Stephen Knight, Southwark—Improvements in apparatus for heating water for baths and other purposes.
2519. John Mason and Leonard Kaberry, Rochdale—Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.
2530. Thomas Restell, Strand—Improvements in guns.
2537. Longin Gantert, 38, Glasfort-street, Glasgow—Improvements in machinery or apparatus for dyeing and bleaching of yarns or threads.
2546. Robert Shaw, Portlaw, Waterford—Improvements in looms for weaving.
2551. James Porritt, Stubbin Vale Mill, near Ramsbottom—Improvements in carding machines.
2555. Cromwell Fleetwood Varley, 1, Charles-street, Somers-town—Improvements in producing and applying dynamic electricity.
2585. John Thom, Birkacre, near Chorley—Improvements in apparatus for singeing or firing cotton and other fabrics.
2604. William Grindley Craig, Gorton, Lancaster—Improvements in railway axle boxes and spring fittings.
2605. Isaac Dodds, Sheffield—Improvements in machinery or apparatus for working the slide or steam valves of steam engines.
2613. Luke Turner, Leicester—Improvement in weaving elastic fabrics.
2665. Thomas Hart, 255, George-street, Glasgow—Improvements in Jacquard apparatus for weaving.
2668. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the extracting tannic acid from leather, and in preparing the leather for the manufacture of glue. (A communication.)
2701. Louis Joseph Frederic Margueritte, Paris—Improvements in the manufacture of caustic and carbonated potash and soda.
2742. Gerd Jacob Bensen, 7, Christian-street, St. George's in the East—Improvement in refining sugar.
85. Christopher Turner, Burnley—Improvements in power looms for weaving.
101. John Greenwood, Irwell Springs, near Bacup—Improvements in sizeing, stiffening, and finishing textile fabrics or materials.
213. Auguste Leopold Lenoir, Paris—Improvements in breech-loading fire-arms.
369. Charles Roper Mead, Langdale-road, Peckham—Improved construction of gas regulator.
393. Robert Mc Connell, Glasgow—Improvements in finishing or dressing textile fabrics.
431. Captain Alexander Theophilus Blakely, R.A., Little Ryder-street, St. James's—Improvements in ordnance.
529. James Bullough, Accrington—Improvements in looms and apparatus for weaving.
591. William Hill, Birmingham—Improvements in metallic pens and penholders, and in ornamenting metallic pens and penholders.
639. John Scott Russell, Millwall—Improvements in ship building.

Sealed May 22nd, 1855.

2464. Richard Terrett, Hercules Buildings, Lambeth—An improved machine or apparatus for cleaning knives.
2472. Edmund Eaborn, Matthew Robinson, and John Kendrick, Birmingham—Certain apparatuses or contrivances for holding hats in churches, chapels, and other public assemblies.
2476. Stephen Shaw, Plaistow—Improved mode of marking metal plates for rivetting or bolting, and the application of a new material as a template for receiving such marks.
2483. Riley Cunliffe, Accrington—Improvements in machinery or apparatus for making or manufacturing bricks and tiles or other similar articles.
2484. Robert Willan and Daniel Mills, Blackburn—Improvements in looms.
2492. Thomas Greenshields, George-street, Derby—Improvements in treating cotton waste that has been used by railway companies, and preparing it to be used again.
2506. Charles Peterson, Low Cliff, Chale, Isle of Wight—The application of a new vegetable substance to the manufacture of textile fabrics and pulp for paper, cardboard, papier mache, and similar purposes.
2509. John Abraham, Standfield, Great Crosby, near Liverpool—Improvements applicable to draining.
2556. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in the arrangement of electric telegraphs (A communication.)
2576. Samuel Heseltine, Harwich—Improvements in the construction of cannon shot and shell.
2593. Edward Maniere, Bedford-row—Improvements in lamps.—(A communication.)
2615. Joseph Mayer, Dale Hall Pottery, Longport, and John David Kind, Birmingham—Improvements in door knobs or handles made of china, earthenware, glass, or other vitreous or semi-vitreous substance, and in attaching the said knobs or handles to their spindles.
2642. Arthur Lyon, Windmill-street, Finsbury—Improvements in machines for reducing or mincing meat and other solid edible substances.
2649. John Sykes, Huddersfield—Improvements in piecing machines, a part of which improvements is applicable to other similar purposes.
2655. Robert Lucas Chance, Birmingham—Improvement in the manufacture of glass.
35. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in machinery or apparatus for effecting agricultural operations, parts of the said improvements being applicable for the obtainment of motive power for general purposes.
327. Richard Shirley Harris, Leicester—Improvements in the manufacture of looped fabrics.
448. Henry Penney, York place, Baker-street—Improved mode of treating vulcanised or cured india-rubber.
617. Alexander Robert Terry, 1, Adelphi-terrace—Improvements in apparatus for copying letters and other documents.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3718	May 21.	Smoke Preventor	Rev. James Burrow	Ashford Parsonage, near Bakewell
3719	"	Improved Semicircular-end Black or Sharp Key for Pianofortes	George Wilkins	Guildford, Surrey.
3720	"	Water-closet Basin and Trap	Henry Doulton and Co.	Lambeth.
3721	"	Brace Ends	William Graham	8, Noble-street, Cheapside.